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INTERPLANETARY MAN?

BY OLAF STAPLEDON

I. Introduction

It is with some hesitation that I address this very expert Society. I feel much as a man might feel who, merely because he once wrote a children's story about a magic carpet, has undertaken to discourse to a society of aeroplane designers about the future of aviation. Contributors to the *Journal* of this truly epoch-making Society overawe me with their scientific knowledge and their wealth of mathematical formulæ! Let me at once put my cards on the table by confessing that my training in science ended when I failed to pass the "London Matric" in what used to be called "organic chemistry," and that my knowledge of mathematics is far more sketchy even than my knowledge of the sciences. I am a dabbler in many subjects, an expert in none. As such, my only function to-night must be to bring to bear on interplanetary travel light from other fields of knowledge.

Modern civilization cannot get along without experts of many kinds. In most fields the day of the amateur is past. But just because this is pre-eminently an age of experts, we have to face the serious danger that the human race may come to consist wholly of experts none of whom understands what his fellows are doing, or why they are doing it, and all of whom are ignorant of the pattern of human life as a whole. Knowledge has become so vast that no single mind can speak with authority save in relation to his own particular corner of it. But such is the prestige of scientific expertism that scientists are apt to make far-reaching pronouncements about matters lying beyond their special competence, for instance about politics, ethics, religion and philosophy. One of the most serious problems of our day is to work out an educational technique which, while producing real experts in each field, will ensure that each one of them will also be a reasonably well informed and responsible democratic citizen. Even when this end has been achieved, it will still be necessary for some people to tackle the work of correlating the various growing points of thought. This is supposed to be the task of philosophers, or of one particular sort of philosophers. They have to learn something from all the main kinds of experts, and to relate the findings in each field to the findings in others. This is indeed a formidable task; and unless these universal intruders combine intelligence with humility, they are likely to make a mess of it, and to be reviled by the experts in every field,

It is therefore with a combination of humility and the hardihood that leads fools to rush in where angels fear to tread that I venture to talk to you at all. The only useful thing I can do is to try to show you how, as it seems to me, your bold and highly specialized venture of interplanetary travel fits into the total venture of man in this formidable universe.

I start with an assumption amply justified by the Society's work. I assume that, if all goes well with man, men will, in fact, be able to reach the other planets within a few decades, and able to effect landings on them. This assumption may, of course, turn out to be unjustified. Unexpected difficulties may arise. Or, on the other hand, all may *not* go well with man. His folly may quite well lead to the destruction of civilization, to the extermination of his species, and even to the extinction of all terrestrial life. It is not entirely fantastic to surmise that he may even blow up his planet, and reduce it to a new swarm of asteroids. In gaining control of atomic energy, man clumsily grasps an instrument of incalculable potency, both for good and for evil. J. B. S. Haldane has suggested that it may be a law of nature that any species that gains atomic power before unifying its world-society must destroy itself. I should myself say, not merely "before it unifies its world-society," but "before it disciplines itself to the true values."

Probably there has never before, in the whole career of our species, been so momentous a crisis as that of our day. Our own human species is said to have begun about a quarter to half a million years ago. For most of this period the river of human life has wandered sluggishly through the plains of time. If we consider the average length of a human generation over this period to be about twenty-five years, then some twenty thousand generations have passed since *Homo Sapiens* began. During almost the whole of that vast period (perhaps a four-thousandth part of the aeon that has passed since the earth's formation) men had little power, and change in human affairs was very slight. Tribes, no doubt, rose and fell. Improvements in technique were rarely discovered; and discovered only to be lost again, and re-discovered ages afterwards. Conditions in a man's childhood were generally much the same as conditions in his old age. But at last this slow and tortuous advance in the techniques of production achieved agriculture, and later the building of cities, the founding of civilization. This seems to have occurred some six thousand years ago, or a little over two hundred and forty generations. The river of human life accelerated somewhat, tumbling forward in rapids. Power and leisure and comfort increased; but almost always only for the few. The masses seem to have been more and more deeply enslaved. Not till almost the end of this six thousand years, say three hundred years ago or about twelve generations, did modern science begin to take effect on human life. Thus man has used science only during the last thousandth part of his whole career, and his career is the last four-thousandth of the period since the earth was formed. In our own day, man is snatching at atomic power. We are the first generation of the atomic age. Change is already far more rapid than ever before, and will soon become catastrophic, for good or ill. The river of human life has reached a precipice. The cataract plunges—whither? It is quite possible that we may be the last of all human generations. Yet, barring

accidents, the earth should be habitable for a period as long as it has yet existed, say two thousand million years, or some eighty million of our present human generations.

There seem to be three possible futures for man: (1) actual and speedy annihilation; (2) the creation of a world-wide totalitarian ant-state, based on atomic power and the reduction of all human individuals to robots; (3) the founding of a new kind of human world, in which the Aladdin's lamp of science will be used wisely, instead of being abandoned to that blend of short-sighted stupidity and downright power-lust that has played so tragic a part in the application of science thus far. It is a platitude that man has gained power without wisdom. If he does not at the eleventh hour, or half a minute before zero hour, become just a little less silly, his doom is sealed. On the other hand, given a modicum of wisdom, we shall be able greatly to raise the conditions of life for all human beings, no matter what their colour, and to afford to every one of them the chance to develop and express such capacity as he has for truly human living and truly human work in the great common enterprise of man. What that enterprise is or should be, I shall consider later.

This possibility of affording to all men full opportunity is now no merely Utopian dream. Its progressive attainment is at last physically possible. Nothing now stands in the way but the ignorance, the stupidity and the evil will of men. And let me say at once, though I shall later enlarge on this point, that the promise is not simply one of increased luxury and hoggish ease. Rather it is a promise of a deepening and enriching of human experience. Man's present condition of constant frustration and torment and fear makes most men to-day think only in terms of the hope of luxury and security. But if ever we do successfully turn our present dangerous corner, and a generation appears that is freed from crippling conditions, then men's minds will at last be able effectively to desire something more than mere luxury and security. Be sure, also, that in the promised world there will be no lack of challenge and danger and even tragedy. The novelty will be rather that man will have outgrown at last the diseases of mere infancy, and will be able to enter for the first time into the more dangerous, more troubled, but ampler and richer and more conscious life of adolescence.

II. If the Planets are Inhabited

At this most critical moment of human history man finds himself on the very threshold of a new freedom, the freedom to travel beyond the terrestrial atmosphere and explore the whole solar system. What should he do with this new power?

Much depends on the conditions of the planets that he visits. Two possibilities must be noted. Either man will find elsewhere in the solar system other intelligences, or he will not. If he does, then again there are two possibilities. One is the possibility of wars between the worlds. This situation might perhaps cause at least a temporary unification of mankind in face of the common danger, much as Russia and the West united against Hitler. The War of Worlds would be followed either by man's defeat and

ruin or by his victory, and then by exploitation of the conquered races for man's advancement. The other possibility is interplanetary co-operation. But in view of our sad inability even to unite mankind, it seems extremely unlikely that man in his present state would succeed in co-operating with alien races on other planets. Far more likely is it that the rival imperialisms and ideologies of this planet would be extended to struggle against each other in other worlds, tyrannizing over and ultimately destroying the native peoples. If, on the other hand, man does soon succeed in unifying his world-society, then it is at least conceivable that some kind of mutually profitable symbiosis with intelligent races on other planets might be established.

On the whole, however, it seems unlikely that any of the other worlds within the solar system is inhabited by any race even approaching man in intelligence. Bear with me while I summarize the data, and correct me later if I am mistaken. Let us begin with our nearest neighbour, the moon. I am told that it is almost wholly without atmosphere and water. There seems to be no reason at all for supposing that it has, or ever did have, intelligent inhabitants. Of the planets themselves, Mercury is far too hot on one side and far too cold on the other. Venus is more temperate, and has a copious atmosphere; but apparently it lacks oxygen, and would not support life such as we know on our own planet. Water also may be lacking. Mars, owing to its feeble gravitation, has already lost most of its atmosphere and most of its water. Indeed, its polar caps may turn out to be composed of carbon dioxide snow, or something worse. However, there is considerable evidence that vegetation of some sort does exist on Mars; but certainly no convincing evidence of the artifacts of an intelligent race. Probably the process of biological evolution on the planet was less rapid than that of the earth, since on the whole, the larger the geographical field, the greater the chance of the occurrence of a wealth of varieties on which natural selection could work. Further, the evolutionary process was probably cut short or greatly retarded by the rapid deterioration of conditions. On the whole, then, it seems unlikely that on Mars life (such as we know) has evolved to the human level. The asteroids are of course much too small. On the other hand, Jupiter and Saturn, and probably all the outer planets, are too big, and have apparently quite the wrong kind of atmosphere for life of the terrestrial type.

Of course, we cannot entirely reject the possibility that on some of the planets life has evolved on a different chemical basis, and that atmospheres lethal to us may be hospitable to biochemical processes alien to ours. But I understand that terrestrial life depends on the unique diversity of the carbon compounds, and that, though a biochemical system based on some element other than carbon is not possible, it would have a far smaller range of compounds, and so the scope of its biological evolution would be very restricted. However, we should not dismiss the possibility that Jupiter or some other great planet is inhabited by minute intelligent creatures whose constitution is quite unknown to us. The evidence is opposed to this view, but not overwhelmingly.

At this point I cannot resist a digression, and indulgence in the wildest fantasy. Fundamentally life seems to consist of a utilizing of some particular

form of the general process of the increase of entropy so as to gather power for the maintenance of vital activities. Life taps and canalizes part of the vast spate of energy, thus forming a "mill-stream" by which its own little "water-wheel" may be worked. Well, might there not be living creatures based not on chemical action but on the energy released by the disintegration of atoms? Might there not be, not on any planet but in the sun's turbulent outer layers or in its middle depths, flame-like organisms of this type, and might not some species of them equal or excel man in intelligence? This is indeed a flagrant digression from the purpose of this paper, for it seems quite impossible that man should ever in his space-ships invade the sun and make contact with such incandescent beings.

To return to our subject, it seems very unlikely that there is any intelligent race anywhere in the solar system, except mankind. Mars is the only planet that should make us hesitate to accept this conclusion, but in this case too the betting is heavily against any highly developed life.

III. If the Planets are Uninhabited

If man finds the planets uninhabited, what should he do with them? If mankind is still disunited, no doubt there will be a race between rival imperialisms to annex those vast virgin territories. The coming struggle between America and Asia, with Europe as a battlefield, might well spread to Mars. Already one of our vigorous but still culturally adolescent cousins across the Atlantic is reported to have suggested that the moon should be annexed as soon as possible as an industrial field for American exploitation. Alas! Must the first flag to be planted beyond the earth's confines be the Stars and Stripes, and not the banner of a united Humanity?

In passing, let us remind ourselves that merely to circumnavigate a planet does not necessarily imply the possibility of landing on it and walking about, let alone staying there and undertaking any sort of survey or industrial operation. Clearly the pioneers would have to be equipped not only with food and water and air for their journey but with pressure-suits, oxygen and an ample water supply for their stay on the planet. And as things stand, they might also need weapons to defend themselves from attack by emissaries from rival terrestrial states.

But let us suppose that mankind has at last become effectively united, both politically and socially. Then what should a united mankind do with the planets?

Obviously, the first thing to do would be to explore them. Sheer scientific curiosity would certainly insist on thoroughly surveying them. They would offer the kind of lure that was offered in the nineteenth century by Darkest Africa, the north and south poles and the unclimbed Himalayas. Bold young people would be very ready to give their services for planetary exploration. Their effective motive would probably be sheer adventure, though the rational justification of such costly and dangerous undertakings would of course be the advance of science. It is conceivable, however, that everything really significant about those desert worlds might be learned by merely circumnavigating them without landing on them. Perhaps men will be so absorbed in

the general advance of science and in the exciting task of creating a really adult human society on earth, that they will simply never bother to take the necessary trouble to set foot on another planet. No doubt this is unlikely, because the irrational, romantic glamour of opening up unexplored worlds will be too strong, even if those worlds turn out to be inhospitable and dreary wastes.

Apart from the motives of sheer curiosity and sheer adventure, the obvious motive for exploring the planets is the hope of discovering immense fields of natural resources, and exploiting them for human welfare. They might, for instance, yield valuable stores of uranium or other sources of atomic power, or any of the rarer elements or minerals needed by man. I am quite incompetent in this field, and must merely note that the motive of economic gain may play a leading part in man's dealings with the planets.

Let us admit, however, that it would be far best for man to postpone his exploitation of alien planets until he had concentrated seriously on improving terrestrial conditions. Equipped with highly developed scientific knowledge and atomic power, he should first undertake the comparatively easy task of turning his native planet into a more convenient and more delectable home. Climates might be improved, coastlines modified, deserts irrigated, jungles tamed, mountains (where they happened to be obstructive) blasted out of the way. Mineral wealth might be brought up from the depths of the terrestrial globe, Antarctica and the great Arctic Islands might be warmed and colonized. And so on. But let us hope that none of these vast enterprises will be attempted till mankind has attained a rather higher level of wisdom, and has a clear knowledge of the kind of world that would really favour human development. For my part, since I am by nature something of a savage, I cannot help hoping also that many regions will be preserved in their wild state for the recreation and refreshment of a species which, after all, is biologically adapted to a primitive environment.

But however desirable this reconstruction of the earth's surface, sooner or later for good or ill, a united mankind, equipped with science and power, will probably turn its attention to the other planets, not only for economic exploitation, but also as possible homes for man. Perhaps the most promising is Mars. If the venture seemed really worth while, that small cold, arid world might be rendered at least habitable, if not a paradise for man. All the necessary materials would be present in the crust of the planet itself. Human ingenuity, with atomic power, should be able to increase the atmosphere and the water supply, irrigate the desert surface, produce a suitable vegetation, and even raise the surface temperature. Whether this huge undertaking would be in fact worth while or not, is a question which I shall consider later. At present I suggest merely that it probably could be accomplished. In frivolous moments one feels that Mars might be used as an extra-terrestrial "Siberia" in which to exile all our really tiresome people. But I fear that the little planet would soon be overcrowded, and Earth depopulated.

Like Mars, the moon could perhaps be rendered distressfully habitable by terrestrial man; though in this case, presumably, the artificial atmosphere would escape far more rapidly, and would need to be constantly replenished.

Incidentally, much of it would be drawn off by the Earth, thus complicating our terrestrial problems by increasing our atmospheric pressure.

What of Venus? The task would probably be much more formidable. From the little that we know of Venerian conditions, it would seem that the first problem would be to alter the composition of the already existing atmosphere, which, so far as is now known, is quite unsuited to terrestrial life. And water, if indeed it is absent, would have to be created in bulk. Then we should have to produce a vegetation for the maintenance of a supply of free oxygen. But on the whole, though Venus offers a more difficult problem than Mars, it might in the long run become a more satisfactory home for man. It is much larger, and of course far warmer. Instead of affording the human colonists a distressful and precarious existence, it might in time rival and surpass the Earth as a home for intelligent beings.

The greater planets would seem to offer no possibility of human colonization, owing to unfavourable atmosphere, chilly remoteness from the sun, and such gravitational pressure that a man's body would be an insupportable burden.

IV. Adapting Man to the Planets

It is time to approach the whole matter from another angle. If the mountain will not come to Mohamet, Mohamet must go to the mountain. If the planets are unadaptable to man in his present form, perhaps man might adapt himself to the alien environments of those strange worlds. Or rather, perhaps a combination of the two processes might enable man to make the best possible use of those worlds. In fact, given sufficient biological knowledge and eugenical technique, it might be possible to breed new human types of men to people the planets.

Once more, Mars seems to offer the best opportunity. It should be fairly easy to produce a variety of *homo sapiens* capable of surviving the rigours of an improved Martian environment. Perhaps the best human stock from which to start would be the Tibetans, who are used to a cold, arid climate and a rarified atmosphere. But unless the Martian atmosphere could be augmented quite a lot, and the surface temperature greatly raised, the specialized human Martians would probably lack the vital energy for any kind of highly developed civilization. Only where nature blossoms with a certain luxuriance can the human spirit itself blossom. However, by a combination of environmental and eugenical alteration, it might perhaps be possible in the long run to establish a vigorous population on Mars.

On Venus, given oxygen and water, man's biochemical and eugenical technique might perhaps produce a well-adapted human variety or a new human species. Since Venerian man would have to stand great heat, the work might start with experiments on some Equatorial varieties of our species. Presumably in that hot world a dark skin would be useful; unless, indeed, permanent shade was maintained by a cloud-blanket over the whole planet. There would certainly be a tendency for a large proportion of the planet's water to remain permanently suspended in the atmosphere.

On the outer planets, eugenics would have to play a major part. Even if the problems of the atmosphere and the extreme cold could be solved, there

would be very great difficulties to face. It would be necessary to create a specially adapted human species of very small stature to cope with the excess of gravitation. This might well involve a serious reduction in the size of the cerebral cortices, with a consequent reduction of intelligence. For intelligence seems to depend on the actual number of top-level cells in the nervous system; or, as it were, on the complexity of the telephone exchange. Thus the attainment of human intelligence in a very small mammal would be impossible, unless some way could be found for greatly reducing the size of the individual cells and the thickness of the fibres without impairing efficiency. There is one other conceivable way out of the difficulty. By very drastic eugenical operation on the existing human form, it might be possible to enable the present human brain to be supported, in spite of excessive gravitation, by throwing man into the quadruped position, greatly strengthening the four legs, and at the same time pushing the head far backwards so as to distribute its weight evenly between the fore and hind legs. But what of the problem of providing hands? The fore-limbs would be fully occupied and unavailable for manipulation. My only suggestion is that the nose might be greatly elongated into a trunk, equipped with delicate grasping instruments like fingers. It would probably be desirable to have two trunks, if not three. The eyes, by the way, would have to be projected well forward from the thrown-back brain-pan, otherwise *Homo Jovianus* would not be able to see where he was stepping.

Enough has been said to suggest that the colonization of some of the planets may in time become practicable, if terrestrial man continues to develop his control of the physical environment through atomic power, and if he attains sufficient biological knowledge and eugenical art to breed, or otherwise construct, human or quasi-human races adapted to strange environments.

But a word of caution is necessary. It is extremely important that none of these eugenical ventures should be attempted without thorough knowledge of the probable indirect results of each proposed change. For instance, it would be disastrous to aim at very small stature without doing something to avoid reduction in intelligence. Further, it is necessary to have very clear ideas as to which human characteristics are unimportant and might be safely sacrificed, and which are indispensable and should never be endangered. Thus good vision, high intelligence, co-operativeness and manual dexterity are indispensable and should if possible be increased; while teeth and cranial hair could if necessary be sacrificed. The result of thoughtless "messaging about" with human nature might be the psychological and spiritual ruin of man.

V. What is it All For?

This brings me at last to the real crux of my subject. Would there be any point in colonizing the planets? What are we getting at? What is it all for? Why not just stay put on our native planet and muck along as before?

Broadly, there seem to be three possible motives that might control man's dealings with the planets. (I exclude scientific curiosity, which, though it might be an important motive with some individuals, is not likely to be the determining factor.)

First, the physical resources of those worlds might be exploited simply in order to increase the luxury of human beings on earth. This aim might involve the creation of industrial settlements on the planets, but it might not involve large-scale colonization. The policy would be simply to use the planets to afford to human beings as much pleasure as possible, to give to all of them the greatest possible affluence; in fact, to create a society in which every individual would have the privileges that only millionaires have to-day. Drudgery would be completely abolished. All manner of superfine food and drink, and all manner of ingenious amusements would be constantly available at the cost of merely pressing buttons or switches. Not only the "movies" but also the "feelies" and "smellies" and "sexies" would provide unending beatitude, in the manner foreseen by Aldous Huxley and others. Any subsequent boredom or lassitude would be at once corrected by means of fresh interests or appropriate drugs. No-one would ever do anything unpleasant or uninteresting. Machines of all sorts would be the tireless and obedient slaves of every man. All men would be aristocrats in the worse sense of the word, not the better. All would be pleasure-addicts, accustomed to every luxury; spoilt children who, through being shielded from the sterner possibilities of life, would simply never grow up. Of course, *before* the attainment of this strictly hedonistic Utopia, many men would have had to live laboriously and dangerously and devotedly, in the cause of science and exploration and invention, in order to make such a luxury-world possible. But once the new order had been thoroughly established, it might maintain itself perpetually with a minimum of direction of human action.

Most of us, I think, would agree that, though a certain amount of luxury is a harmless and even civilizing thing, there is a point beyond which the increase of luxury leads to spiritual degradation. Man has risen by versatility and intelligence. If he were to enter at last upon a stable condition of perfect adaptation to an unchanging environment, he would gradually lose his distinctive powers. Intelligence would atrophy. The world-society might perhaps survive unchanged for millions of years; but sooner or later man would be confronted with some new challenge from the environment, and would have lost the wit to cope with it. I conclude that if the fruit of all the devotion of the British Interplanetary Society is to be merely the debauching of mankind with the riches of other worlds, you had better all stop paying your subscriptions.

The second possible aim in relation to the planets is simply to increase man's power over the environment, and to extend that power so as to tackle fresh environments.

In the heyday of the industrialization of Europe and America, power did seem to many people an end in itself. The craving to leave one's mark on the environment, any sort of mark, so long as it is *my* mark, made actually by me, is very strong in a certain type of uncultured mind. Human animals carve their initials on trees, rocks, school desks and public monuments. They deface beautiful objects simply for the lust of power. They satisfy their primitive impulses for construction thoughtlessly, without regard to the

remoter consequences; sometimes harmlessly, but sometimes disastrously in ways that are less *constructive* than *destructive*. Children harmlessly make mud pies or play with meccano sets. Adults less innocently build empires or great commercial ventures. Generally some fairly plausible excuse is found for all this feverish activity. The mud pies are magic castles; the empires, instruments of civilization; the commercial ventures, purveyors of comfort or luxury. But at bottom the motive is often simply the insatiable itch to make a mark on the environment, any old mark, but the bigger the better. In itself, the impulse is harmless, even worthy; but we have to learn to make our mark in inoffensive and if possible actually useful ways.

More precisely, the itch to leave a mark is quite wholesome, on condition that, even if it does not actually serve some higher aim, at least it does not positively hinder proper development. It must not be allowed to degenerate into mere obsessive doodling or meddling on however vast a scale. The danger for mankind as a whole is that, having solved its present urgent problems it will slip in to the assumption that the goal of all its corporate action is simply to make a bigger and bigger mark on a bigger and bigger environment. Power is all too apt to become an end in itself. In the old days self-assertive individuals aimed at local tyranny or world empire. Henceforth they will be more likely to dominate either through money power or through fulfilling important functions domineeringly in a highly organized state, perhaps a world-state of totalitarian type. It has been said that power corrupts, and absolute power corrupts absolutely. Those who control the world-state, whether it is capitalist or communist or social-democratic, will be in danger of grave corruption unless they are imperturbably orientated to the true values. They will readily idealize their own power lust, and persuade mankind that the right goal for man is simply dominance over the environment. And so in time the planet may approximate to Aldous Huxley's *Brave New World*, in which society is organized to the extreme pitch of efficiency with the aim simply of producing as much as possible. In that horrid world the workers are given unlimited easy pleasure, while the élite, the bureaucrats and technicians, have the satisfaction of directing the whole life of society.

If the future terrestrial society is organized on these principles, then the other planets will be used for the same end. Ostensibly the aim will be to use them as sources of raw material for man's comfort and luxury, on this planet or others; but behind this orthodox economic motive will lie the unacknowledged motive of sheer power. And if individuals can be corrupted by power, so can a whole species. Man may become obsessed with a passion merely to make a big mark on the solar system. In principle there is no difference between this aim and that of the urchin who sets fire to the heath or throws stones at windows.

The third possible motive for gaining control of the planets is that of using them to make the "most" of man, or the "best" of him; in fact, for the full expression of the most developed capacities of the human species. Here we have a goal which, though extremely vague, is more promising. What does it really imply? Broadly, it may be interpreted in two different ways, one purely humanistic, the other involving a reference to something over and

above man, though it is known to us mainly through its imperfect manifestation in man himself. The question to be faced is this. Are we justified in regarding man *simply* as an end in himself? Is "good" *simply* whatever man wills? Is a thing to be called "good" merely *because* or *in that* man wills it? Or, on the other hand, is man to be regarded rather as a means to an end, an instrument for the fulfilling of an end that is in some sense independent of his actual nature in its present stage of development? These questions cannot be even clearly stated, let alone answered, without raising very difficult philosophical problems. They cannot be truly answered with a plain "yes" or "no." Rather the answer must be of the type, "In one sense man is an end, in another sense not an end but an instrument." In the same manner the physicists may justifiably say that in one sense an electron is a particle, and in another sense not a particle but a train of waves.

VI. Fundamental Values

Perhaps we shall be able to form more precise ideas on this subject (which really does concern an interplanetary society) if we try to answer the question, "What is man?"

Clearly, whatever else he is, he certainly is (or has) a body, which is a physical or electromagnetic system of protons, electrons, etc. J. B. S. Haldane (I think) remarks somewhere that the human body contains some millions of millions of millions of millions of hydrogen atoms, and corresponding amounts of other elements. Julian Huxley (I think) has pointed out that man's body is approximately half-way in size between an electron and the whole universe. Astronomically, man is very small, an inconceivably minute parasite on a minute planetary grain floating in an immense void that is extremely sparsely sprinkled with great suns. Size is in itself of no importance; but if in the minute human body the physical can be the vehicle of some degree of mind or spirit, how great may be the mental and spiritual capacity of the whole cosmos of star-systems!

Biologically, man (as we have already noted), or rather our own species of man, which we have ludicrously called *Homo Sapiens*, is of very recent growth. But he is the most developed of terrestrial organisms. That is, he is objectively the most complex, integrated, versatile. He has specialized in being unspecialized. Hence his remarkable adaptability, and his dominance over all other species. He has indeed made a bigger mark on this planet than any other species, and a much more complex and purposeful and organized mark. Basically he remains just a mammal, a primate. His unique gift is his relatively high intelligence, which has depended on the unique development of hands and eyes and cerebral cortices. There is good reason to believe, however, that man is a very imperfect species. The bird is just about perfected for its appropriate life, for flight in the terrestrial atmosphere; but man, though he has powers far beyond the range of the bird, has not perfected those powers. In his appropriate medium of intelligent purposive action, abstract thought, personal sensibility and artistic creation, he is little better than a clumsy flying lizard.

Psychologically, what is it that distinguishes man from the sub-human creatures, even from his nearest relatives, the apes? He has the same ground plan of organs, reflexes, innate behaviour and emotional reaction. He shows fear, aggression, self-regard, sexuality, gregariousness, curiosity, manipulative meddlesomeness, and so on. What is distinctive in him is his superior power of discrimination, of attending to likenesses and differences. Hence his native intelligence, by which I mean the power of solving *novel* problems, not to be solved by instinct or by established habit. This unique aptitude for discrimination and intelligence has opened up for him vast new universes or experience, impossible to any other terrestrial creature. All intelligence involves the power of attending to the relevant while ignoring the irrelevant. Hence, in man, comes the power of abstraction, of attending to a particular character and relating it to other instances of the same character, and giving the identity a name, such as "red," "two," "pleasant." Hence language and all the worlds of abstract thought and of concrete poetry.

Man's great power of concentration of attention has been applied not only to the environment but also to his own nature. Thus he has developed the possibility of a unique kind of self-awareness and awareness of other selves. In fact, he has become capable of personality, and of genuinely personal relationships, including all the forms of developed loving and hating. From this has arisen a distinctively human or personal kind of sociality. In sub-human animals, sociality is no more than a combination of the impulse of gregariousness (including self-abasement to the herd) and the impulse of self-assertion, rising to dominance over the herd. Of course, human beings themselves often behave in this sub-human way, but the distinctively human or personal way is something of a different kind, in that it involves respect for the other as a conscious person. The distinctively human society is best understood by considering the nature of genuine human love, which again is beyond the range of sub-human consciousness.

When John *really loves* Jane, he does what no beast can do. He does not *merely* have a pleasant glow of feeling about her. Of course he has this, but something more also. He is aware of her as a conscious being, distinct from himself, and different in character and needs and capacities. He accepts her as she is, without wishing to impose his will on her. He respects her as a person, takes responsibility for her, cherishes her, depends on her, is mentally enriched by knowing her and loving her, and is profoundly moulded by her. The two together form a little society of distinct beings united in mutual love, and cherishing not only each other but also the "we" that they together form. No doubt they also remain self-regarding individualists, and their self-interests often conflict. All love is complicated by hate. But in genuine love the conflict is largely transcended in the will for mutual adjustment and mutual dependence.

Perhaps I ought to apologize for wandering so far from the planets. But, believe me, this digression is very relevant to my theme. If one undertakes to discuss what man ought to do with the planets, one must first say what one thinks man ought to do with himself. And that is what I am trying to do. It cannot be done without a certain amount of fundamental thinking,

not in the way of theorizing about the universe, but through trying to get a clear view of human experience itself.

Well, to continue this venture, from the experience of love or friendship or some form of genuine community in the field of personal contacts, the human individual may rise to the will for genuine community in *all* his dealings with his fellow human beings, no matter how slight his contact with them. Thus arises the ideal of universal Christian love, or the brotherhood of man. This ideal has haunted man for thousands of years. In one form or another, it has played an important part in all the great religions of the world. In Christianity, love is deified. God, we are told, actually is, in some obscure way, Love. The Holy Spirit is Love. And love is believed by Christians to be the fundamental power which created the universe. To believe such a proposition seems to me to go far beyond the legitimate scope of human thinking; but the fact that in the past many of the best minds *have* believed this has to be taken into account.

Why is it that love, kindness, fellowship, genuine community between persons, in fact, the distinctively human or rather personal kind of sociality, has been so greatly praised? Obviously it has survival value. And if you are determined to explain the most developed kinds of human experience and behaviour, *simply* in terms of the social conditioning of primitive impulses, quite a plausible explanation can be given. But this explanation does not go to the root of the matter. It is sheer dogma that the most developed and conscious human experience and behaviour can be fully explained simply in terms of its primitive sources. To do so is to leave out the most distinctive thing about man, namely his power of standing outside himself, to some extent, and being interested in things other than himself for their own sake. Anyone who has really been in love should understand this. Anyone who has had any genuine religious feelings should know it even better. The great Saints, Western and Eastern, were concerned (I should say) with experiences at the highest reach of human capacity, experiences which cannot be adequately described in terms of merely primitive impulses. I would add that neither should we accept uncritically the saints' own interpretations of their experiences, stated in terms of their own contemporary ideas about the fundamental nature of the universe. Human language and human thought itself were not then, and are not even now, sufficiently developed to make reliable statements about those most fully "awakened" experiences. Nevertheless, the experiences themselves, I suggest, are extremely important for anyone concerned with the proper ordering of human life. Someone may protest that, however important these experiences were to the saints, they are of no importance to us, because we do not share in them. The objection is worth answering. No doubt the saints had religious experience in a peculiarly vivid and compelling form which most of us cannot attain. But even ordinary men and women, or at any rate the more sensitive of them, if they take the trouble to discipline themselves a little, and concentrate their attention on their felt relation with each other and with the universe, can quite well discover in their own experience the *kind* of thing that the great mystics were trying to describe.

For lack of a better term, I shall call this most significant kind of experience

"spiritual experience" or "experience of spirit." But I hasten to add that the word "spirit" need not be taken to mean some *thing* or *substance* other than matter, which is conceived as another thing or substance. Still less must spirit mean a divine person or God. I mean by "spirit" simply a particular way of experiencing and behaving. In fact, it is that kind of life which Christians sometimes call "the life of the spirit" or the "Way" of the Spirit, and Chinese sages have called simply "Tao," the "Way." What kind of a life the spiritual life is, I shall consider presently, trying to describe it in modern language and in relation to modern experience.

Meanwhile, I suggest that whatever *theories* men invent to justify the goodness or rightness of that way of life, what actually confronts them in their direct experience is simply a vision of the Way itself as supremely right. Whatever the status of spirit in the universe, what matters is simply spirit. The saints and sages yearned for the full expression of spirit in their own lives and the lives of others. They yearned to outgrow, or wake up from, the life of mere self-interest. They sought the ampler view. They sought, through self-denial, a real self-detachment for the sake of the ampler view, the deeper, more penetrating view. Through the discipline of the ordinary self-interested worldly self, they sought to "wake up," and adopt the point of view of a supposed universal self. Sometimes they persuaded themselves that they were actually gathered up into that supreme self in mystical communion; but even if one feels very sceptical about this, and about the existence of such a universal self, one must recognize that what they strove for was a transcendence of the limitations of mere *self*-concern, a self-forgetting through concern for other individuals and for the whole universe. In fact, a vision of the spirit as an ideal way of living, and as in some sense what we are *for*, intruded into their ordinary experience and claimed their allegiance.

But what *sort* of a way of life is the spiritual life? Leaving out the intellectual trappings of religious and metaphysical doctrine about the universe and fundamental reality, and bearing in mind aspects of knowledge that were not available to the ancients, I think we can express the essence of the matter in modern language. The very brief account that I shall give would not satisfy the ancient teachers or their modern followers, just because it leaves out the metaphysical doctrines; yet it does seem to me to describe the essence of their experience, in so far as it can have any meaning at all for ordinary human beings.

I must begin with a few words about the nature of personality, for the spiritual way is essentially a way for personal beings. Something is aware of something. "I," whatever that is, am aware of my body in its physical environment, and also of my "self" or psychological personality (as a creature with a certain character, needs and capacities), also of other persons, of societies of persons, of abstractions such as physical laws and moral principles, and (in a very sketchy way) of a whole objective universe *in* which I am. No doubt my awareness of these things is very confused and erroneous, but we all assume that there is *something* to be aware of, something which is independent of our experiencing it. In fact, there *is* an objective universe.

Now the innermost ring of objectivity, so to speak, is my own body in its relation with a physical environment. My body is experienced as a going concern, as dynamic, as tending toward certain actions and needing certain things of the environment. I consciously "espouse" my body's needs. I desire their fulfillment. For instance, when my body needs food, I desire the activity of eating. Similarly with the needs for sleep, sexual activity, and so on. In infancy this innermost ring of objectivity is all that is experienced. But gradually the growing child becomes aware of another ring of objectivity, namely that of conscious persons. He begins to be self-conscious and other-conscious. He "espouses" the needs of his own psychological person, and (less constantly) of a few other persons, such as his mother. In genuine love we "espouse" another person, forming a psychological symbiosis with him or her. The important point is that both the other person and my own self, with its particular character and needs and powers, are facts objective to my awareness of them. Of course, my awareness of them may be largely erroneous, I may make mistakes about them, as about any other objective facts. But they are not just fancy. They are what they are.

Beyond the sphere of the persons with whom I have personal contact, we may place another ring of objectivity, namely that on which occur all societies of persons, and the incipient society of mankind as a whole. Beyond again, comes the ring of abstract ideas, true and false, both kinds being objective to the experiencing "I." True ideas, in the final analysis, are simply objective characters apprehended by minds, and abstracted from their particular settings. The idea "dog" is the common character distinctive of all dogs. Of course, all ideas are partly false, some more so, some less. But even the false elements in ideas are rooted in objectivity. So to speak, they result from "squinting" objective characters together in wrong patterns, much as the drunkard may see two moons instead of one. He sees one moon twice, or in two places. Consider the idea of a "centaur," half horse, half man. There's no such beast; but the idea "centaur" is the product of "squinting" half a man and most of a horse together, and so forming a new abstract idea.

Now the overwhelmingly most important abstraction is the spirit, the ideal way of life. It is an ideal which is implied in, and emerges from, the actual experienced nature of personal beings, much as the law of gravity is implied in and emerges from the actual experienced nature of the behaviour of falling objects and the movements of planets and stars.

In the same way the ideas of good and evil and all possible kinds of values arise out of the impact of some region of objectivity on the conscious individual. Mere abstract subjectivity is no more than a featureless possibility of being aware of something, including values. All values arise from the conscious "espousal" of objective needs. Some are needs of one's own body, some are the more subtle needs of persons, myself and other selves.

Note further that personality *involves* community. There cannot be true personality save in true community with other persons. By community I mean not simply a relationship in which each individual strives to use others for his own advancement but the distinctively human social relationship, in

which individuals are united in mutual respect for each other *as persons*. The spiritual way is essentially a way for persons in community with other persons. As Christians might put it, it is the way for a "Church," not simply for the individual, seeking individualistic salvation. As Communists might put it, it is the way for comrades working devotedly in a common cause.

Now I suggest that the spirit is essentially the way of life in which we strive towards full, comprehensive and true awareness of the objective universe, and toward appropriate feeling and appropriate creative action in relation to it. The universe, of course, includes oneself as an object, a self among other selves. In the spiritual life one strives for sensitive and intelligent awareness of things in the universe (including persons), and of the universe *as a whole*. One strives also for appropriate feeling about things and people and the universe as a whole, without prejudice in favour of oneself as an individual or one's own family or nation, or even the human species. Finally one strives for appropriate and creative action in relation to all this.

The experience of the spirit, as the supreme good and as in some sense what we are "for," needs no support from metaphysical argument or religious doctrine. It is simply "given," as a datum, to the relatively awake mind, or rather to the awake mind that has not been perverted by obsession with some minor good, such as power, or bemused by some particular theory, such as materialism or theism. Let us never forget that, if theism is a frail invention of the human intellect, so is materialism. All such ambitious theories are almost certainly more false than true. All such metaphysical speculation, though interesting and educatively valuable, is quite unreliable, whether as support or denial of the experience of spirit, which needs no support other than its own overwhelming authority for the awakened mind. We all know the difference between being less awake and more awake, less responsive to the objective environment and more so. And we all trust our relatively more awake states more than our relatively somnolent states; for the very good reason that, the more comprehensively and accurately we are aware of the objective environment, the more our enterprises are likely to succeed. The kind of experience that I have called "spiritual" comes with an undeniable sense of "being very much awake," in the sense that it presents a vision or revelation of aspects of the objective reality that are *not* revealed in the self-absorbed kind of experience.

Incidentally, the more awake kinds of experience are also the more developed biologically and psychologically, and have had survival value in the long run. But in the sphere of spirit, survival value is not itself the test. The criterion must be simply the verdict of the most lucid consciousness itself, which emphatically declares the way of life called spiritual to be the highest good.

VII. A Commonwealth of Worlds

In the light of this all too superficial discussion of the spirit, I can now say what, in my view, is the right use of the planets.

If any of them is inhabited by intelligent beings, then clearly man should

do his utmost to adopt a relationship of genuine community with those non-human intelligences, seeking earnestly to enter into their point of view, and to co-operate with them for mutual enrichment, both economic and spiritual.

But since it is unlikely that any other planet is in fact inhabited by intelligent beings, then the question that we must answer is, what should man do with those virgin worlds? And the answer is that he should deal with them precisely as with his native world. He should use them neither for the sole purpose of increasing his luxury, nor simply as a means to power for mere power's sake. He should use them for the spirit. He should avail himself of their resources in such ways as to advance the expression of the spirit in the life of mankind. He should use them so as to afford to every human being the greatest possible opportunity for developing and expressing his distinctively human capacity as an instrument of the spirit, as a centre of sensitive and intelligent awareness of the objective universe, as a centre of love of all lovely things, and of creative action for the spirit. He should strive to make of the human race a glorious example of personality-in-community, a society of very diverse individuals united in mutual insight, understanding and sympathy, and in co-operative expression of the spirit. And for the full expression of the spirit in any community, the greater the diversity of individuals the better, provided that they all have sufficient imagination to enter into each other's points of view.

It is in this connection that the planets open up new possibilities. If man can establish in some of those other worlds new and specially adapted human or quasi-human races, then those races, living in their appropriate ways, should develop new expressions of the spirit at present inconceivable to terrestrial man. And through the intercourse of these diverse worlds, provided that each species has sufficient imaginative power, all should be spiritually enriched. Thus the goal for the solar system would seem to be that it should become an interplanetary community of very diverse worlds each inhabited by its appropriate race of intelligent beings, its characteristic "humanity," and each contributing to the common experience its characteristic view of the universe. Through the pooling of this wealth of experience, through this "commonwealth of worlds," new levels of mental and spiritual development should become possible, levels at present quite inconceivable to man.

A homely analogy may be hazarded. The really satisfactory marriage is not one in which husband and wife have identical character and interests, but one in which each is as different as possible from the other, though each has enough imagination to enter into the other and share the other's interests. In fact, the satisfactory marriage is a unity in diversity and a spiritual symbiosis.

Another analogy may help. Mankind to-day is deeply divided between two profoundly different systems of thought and value, two ideologies. Roughly, these ideologies centre upon America and Russia respectively. Each, I believe, contains very important truth which the other ignores. If war is avoided, and if in due season each side can learn from the other, the result may be a far more adult and spiritually enriched humanity than could ever have occurred without this cultural clash of mighty opposites. Incidentally, I cannot help hoping that Western Europe, and particularly Britain, may play

an important part in the unifying of the two half-truths. For Europe is in a position to sympathize with both the half-truths. Formerly champions of individual liberty, we are now being forced by dire circumstances to plan our own society and discipline our individualistic impulses. Perhaps we shall be able to give the world an object lesson in planning for liberty. Add to this the fact that after all, with due respect to those vigorous adolescents, the Americans and the Russians, Europe, with all its faults, is relatively adult; and moreover is the custodian of a great tradition of civilization and spiritual life which has still an important function in this largely barbarian world. America and Russia, yes, and India and China, have doubtless momentous parts to play in the future; but to-day it is the European temper, yes, and particularly the temper of this island people, that is needed to restore unity to a divided mankind, and save our species from destroying itself. It is a solemn thought that perhaps our actions here and now, in this island, in this great city, may determine whether that dream of a commonwealth of worlds is to be made real or made for ever impossible.

VIII. Man and the Cosmos

I shall now add a postscript on a larger theme. Thus far we have been considering only the solar system. What of the stars? What of the galaxies of stars? And the cosmos as a whole? Interstellar travel seems to us the wildest fantasy. However, we should not entirely rule out the possibility that a human race far more advanced than ourselves might some day travel far beyond the limits of the solar system. It might for instance be possible, through skilled use of atomic power, to propel a planet on an interstellar voyage. The substance of the planet itself would have to be used up for the initial propulsion of the planet beyond the range of solar gravitation, also for subsequent steering, also to provide its inhabitants with heat and light and food on the longest of all voyages. For the shortest of interstellar voyages would certainly take a very long time, in fact, thousands or millions of years. But if the task was considered worth while, it might perhaps be undertaken. And, who knows? It might conceivably be worth while to explore in this way some of the nearest planetary systems. But the method would obviously be extremely cumbersome. It is not quite inconceivable that a far better method may some day be developed. In view of recent spectacular but still very fragmentary discoveries in the field of paranormal psychology, it is just possible that communication with intelligent races in even the remotest planetary systems may be effected by a highly developed technique of telepathy. This, of course, is a surmise of the wildest sort; but to-day, when the very foundations of our knowledge are being transformed, it should not be ignored.

One thing we can say with confidence. If, by one means or another, man does succeed in communicating with intelligent races in remote worlds, then the right aim will be to enter into mutual understanding and appreciation with them, for mutual enrichment and the further expression of the spirit. One can imagine some sort of cosmical community of worlds.

Further, we may, I think, be certain that, wherever, in any age or any

galaxy, beings exist who are developed up to or beyond the level of awareness precariously attained by man at his best, there the imperious claim of the spirit, and therefore the ideal of personality-in-community, will surely be recognized. For this ideal and this claim are implied in the very nature of the awakened consciousness. It is nonsense to suppose that any humanly or superhumanly developed beings might permanently seek quite different values. The ideal of the spiritual life is involved in the very nature of personality. Apart from special cases of perversion or obsession by minor ends, the supreme end, which is the fulfilling of the spirit, cannot but be acceptable to the awakened consciousness. The ultimate goal of all awakened beings must inevitably be (how can one least misleadingly put it?) the expression of the objective cosmos in subjective experience and creative action, the fulfilment of the cosmos in cosmical awareness.

The more obvious way in which this goal is to be approached is through a cosmical community of worlds. But such a community may be nothing but the most fantastic of human dreams. Far more probably, the intelligent races within the cosmos may be for ever isolated from each other by the spatial immensities. In this case we are faced with two alternatives. We may suppose that God himself (or the supra-temporal mind of the cosmos) embraces in a single cosmical experience, all the worlds and all their age-long lives; or we may declare simply that the goal of cosmical awareness is not attained, and is only a crazy human fantasy. In this case we may suppose either that there is no general purpose at all behind the cosmos (which may very well be the case), or else that the purpose is something wholly unintelligible to human minds, and indifferent to the expression of the spirit in any world. Or we may suppose that it is equally false to say either that there is or that there is not a cosmical purpose, since the truth is utterly beyond our comprehension. The cabbages in a garden are grown not that they may fulfil themselves in flower and fruit but simply that, before reaching maturity, they may be eaten. Similarly, it may be that the intelligent worlds of the cosmos are required merely to reach a certain low stage of spiritual growth before being destroyed. Let us remember, too, that, if modern physics is correct, there awaits all worlds the cosmical night promised by the increase of entropy. Thus there is a race between cosmical fulfilment and cosmical death, between the complete awakening of consciousness in the cosmos, and eternal sleep.

But, probably these wild speculations are all entirely beside the mark, because conceived in terms of ideas wholly inadequate to the actual conditions of the cosmos. For instance, our conception of time itself is now turning out to be very incoherent and superficial. Perhaps (who can say) from the point of view of eternity the end of the cosmos is also its source and its temporal beginning. Perhaps the ultimate flower is also the primal seed from which all sprang. Perhaps the final result of the cosmical process is the attainment of full cosmical consciousness, and yet (in some very queer way) what is attained in the end is also, from another point of view, the origin of all things. So to speak, God, who created all things in the beginning, is himself created by all things in the end.

Such fantasies may have some kind of symbolic truth, just as the Bible story has symbolic truth. Anyhow, whether true or false, they may at least help us to feel something of the mystery and immensity that surrounds our little human life.

To-day there are hints that the immensity may be far greater than is supposed even in modern astronomy. Paranormal investigations obscurely suggest that the whole spatio-temporal physical universe may be but one very limited and easily misinterpreted aspect of an underlying reality which transcends space and time and the whole seeming-solid world of common sense and science. This is not the place to open up so vast a subject; but I should like to make one comment. Even if in the end these uncertain hints are justified, we shall not have to suppose that therefore the familiar universe is unreal, or sheer illusion. Rather it will have to be regarded as real but not the whole truth; and as "false" merely if we take it to be the whole truth. Further, it seems clear that, whatever the immensities beyond our familiar sphere, for us, who are so deeply implicated in this sphere, the supreme concern must continue to be life here and now. What we have to do is to make the best of this planet of ours, and perhaps of other worlds also.

DISCUSSION

Mr. R. A. SMITH proposed a vote of thanks to the speaker, saying that he was particularly grateful for the philosophical support he had given to the interplanetary enterprise. It was hard, however, to feel any kinship or sympathy with some of the weird types of "man" that Dr. Stapledon had invented for the colonisation of very large planets. To this Dr. Stapledon replied that he could accept any life-form, however alien, if it was orientated to the fundamental values—which he considered must hold for all races at all times.

Mr. A. C. CLARKE then formally opened the discussion, commenting first on some technical points. He thought that life—though not intelligent life—might be more common and more varied in the Solar System than generally imagined. Even ignoring the four giant planets (which seemed to be partly gaseous) there were fourteen bodies of over a million square miles, and at least two hundred asteroids of over ten thousand square miles area. We had plenty of exploring to do!

Dr. Stapledon had touched on the possibility of telepathic contact with other races: but presumably as far as the Solar System was concerned, some sort of clairvoyance would be required, since there would be no intelligence to "transmit" at the other end. Mr. Clarke had often been given vivid descriptions of Mars by mediumistic characters, and he hoped that, before the first expedition, such reports could be collected as it would provide a unique opportunity for a convincing proof. However, the Technical Committee would be most annoyed if, after it had worked for years on atomic spaceships, the clairvoyants got to Mars first.

Dr. Stapledon, Mr. Clarke thought, had somewhat over-estimated the—admittedly enormous—difficulties of *interstellar flight*. If highly efficient atomic step-rockets could be developed, speeds of over 90 per cent. of the velocity of light were theoretically possible. The nearest stars could thus be reached in five or ten years—though the elapsed time to the crew might be much less than this, thanks to relativity effects.

Mr. Clarke did not think that Man could ever take part in a Galactic culture, even assuming that the technical difficulties involved could be overcome. The human mind would be strained to the utmost to deal with a solar civilisation of even a dozen worlds. A *galactic* society implied an increase in complexity of perhaps a thousand million. However, it was foolish to worry about these ultimate questions: what we had to do now was to make the best of our own planet, and of the other worlds when we reached them.

Many members of the large audience then took part in the discussion, and the following are some of the points raised.

One speaker suggested that before human beings colonised Venus, its climate and atmosphere might be modified by suitable plant forms projected from Earth, adding that perhaps terrestrial life came originally from Mars in a similar manner.

A chemist decried loose talk of destroying the human race by atomic energy: the *daily* increase in population equalled the casualties produced by the Nagasaki bomb. Fissile materials were so rare that it seemed most unlikely that they could ever be used to alter climates or geographical features.

Another speaker wanted to know what would happen if we met a race at about the same level of culture. Which would pickle which? It was suggested that there would be insuperable difficulties in communication if we encountered beings whose senses were entirely different from our. There might be a total lack of understanding like that depicted in Wells' *Country of the Blind*.

One member wanted to know if it might not be better to adapt *non-human* terrestrial life forms to colonise the planets, instead of trying to evolve new types of man.

A final speaker said that if we encountered inferior races, we must not put them in reservations, but must educate them. The selection of suitable colonists would also be a difficult psychological problem.

In reply, Dr. STAPLEDON said that though in this time of crisis we must put our own house in order, scientific endeavour must not be too utilitarian, but must always be opening up new frontiers. We must also preserve a sense of humility and piety towards the unknown: of late, humanity had been guilty of *hubris*—pride in achievement.

Dr. Stapledon did not agree that he had exaggerated the potentialities of atomic energy. Our present use of heavy elements was only a beginning—later we might release power from the lighter ones, as the stars do.

If we met a race that nearly matched us in culture, Dr. Stapledon hoped that co-operation would be possible, and that we would not treat it as we had treated the aborigines. On the other hand, if it was superior and turned Earth into a reservation, that would be the end of humanity, as it would lose the will to live. He agreed that we should try to educate other races—as long as we were sure we were educating them *up* and not *down* to our level.

He thought that races with *utterly* different senses were impossible. If they shared the physical universe with us, then they must have at least some senses in common with mankind, since they would have to perceive and manipulate matter. Even if they possessed senses outside our range (e.g. electrical, infra- or ultra-visual) we would still be able to comprehend them.

Dr. Stapledon did not think that it would be practicable to develop non-human life forms for interplanetary colonisation. It would be too great a task to bring them up to our level first. According to Huxley, no other existing species could develop human intelligence—they were all too specialised in other directions.

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